

**Installation Restoration Program  
Final Third Quarter 1999-2000  
Groundwater Monitoring Report**

**143rd Combat Communications Squadron  
Seattle Air National Guard Station  
Washington Air National Guard  
Seattle, Washington**

**July 2000**



**Air National Guard  
Andrews AFB, Maryland**

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**Installation Restoration Program  
Final Third Quarter 1999-2000  
Groundwater Monitoring Report**

**143rd Combat Communications Squadron  
Seattle Air National Guard Station  
Washington Air National Guard  
Seattle, Washington**

**July 2000**

**Prepared For:**

**Air National Guard  
Andrews AFB, Maryland**

**Prepared By:**



**Environmental Resources Management  
915 118th Avenue SE, Suite 130  
Bellevue, Washington 98005**

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## LIST OF ACRONYMS/ABBREVIATIONS

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<u>Acronym/ Abbreviation</u>	<u>Definition</u>
ANG	Air National Guard
ANGS	Air National Guard Station
ARAR	Applicable or relevant and appropriate requirement
ASTM	American Society for Testing and Materials
CCSQ	Combat Communications Squadron
cis-1,2-DCE	cis-1,2-Dichloroethene
COC	Contaminant of concern
ERM	Environmental Resources Management
IRP	Installation Restoration Program
µg/l	Micrograms per liter
MTCA	Model Toxics Control Act
PCE	Tetrachloroethene
pH	Acidity/alkalinity
PSG	Project screening goal
QA/QC	Quality assurance/quality control
QC	Quality control
RI	Remedial Investigation
TCE	Trichloroethene
VOC	Volatile organic compound
USEPA	United States Environmental Protection Agency

## EXECUTIVE SUMMARY

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Groundwater samples were collected in February 2000 at the Seattle Air National Guard Station in Seattle, Washington, as part of a quarterly groundwater monitoring program. Thirteen monitoring wells were sampled using low-flow purging and sampling methods. The groundwater samples were analyzed for volatile organic compounds.

Static water levels in the monitoring wells were measured prior to purging and sampling the wells. Depths to water ranged from approximately 6 to 9 feet below ground surface. The inferred groundwater flow direction was toward the south-southwest, consistent with previous observations.

Chlorinated volatile organic compounds (VOCs) were detected in six monitoring wells. The detected concentrations were below Washington State Model Toxics Control Act (MTCA) Method A Cleanup Levels in five of the six wells. Trichloroethene (TCE) was detected at concentrations ranging from 2.9 to 12 micrograms per liter ( $\mu\text{g/l}$ ) in wells MW-4, MW-6, and MW-8 in the southern portion of the Station. The TCE concentration in well MW-8 (12  $\mu\text{g/l}$ ) was above MTCA Method A Cleanup Level of 5.0  $\mu\text{g/l}$ . Tetrachloroethene was detected at a concentration of 4.1  $\mu\text{g/l}$  in well BS-004PZ at the north end of the Station. Cis-1,2-dichloroethene was detected at concentrations ranging from 1.0 to 5.8  $\mu\text{g/l}$  in wells MW-5, MW-6, and MW-8 in the southern portion of the Station. 1,1,1-Trichloroethane was detected at a concentration of 1.2  $\mu\text{g/l}$  in well MW-9 in the northern portion of the Station.

Time series plots of contaminant concentration versus groundwater elevation were produced for select monitoring wells. Portions of the data for wells MW-4 and MW-8 indicate an apparent correlation between dissolved contaminant concentrations and temporal water table fluctuations.

The source of the chlorinated VOCs detected in groundwater has not been identified. Observed TCE concentrations in monitoring wells MW-4 and MW-8 appear to depend in part on groundwater elevation, which suggests that there may be a residual contaminant source (e.g., sorbed-phase VOCs) in soils near the water table proximal to these wells. As discussed in the Phase II Remedial Investigation Report (ERM 1999a), the



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TCE detected in monitoring wells in the southern portion of the Station may be related to the dissolved TCE plume beneath the Boeing facility immediately south of the Seattle ANG.

## SECTION 1.0

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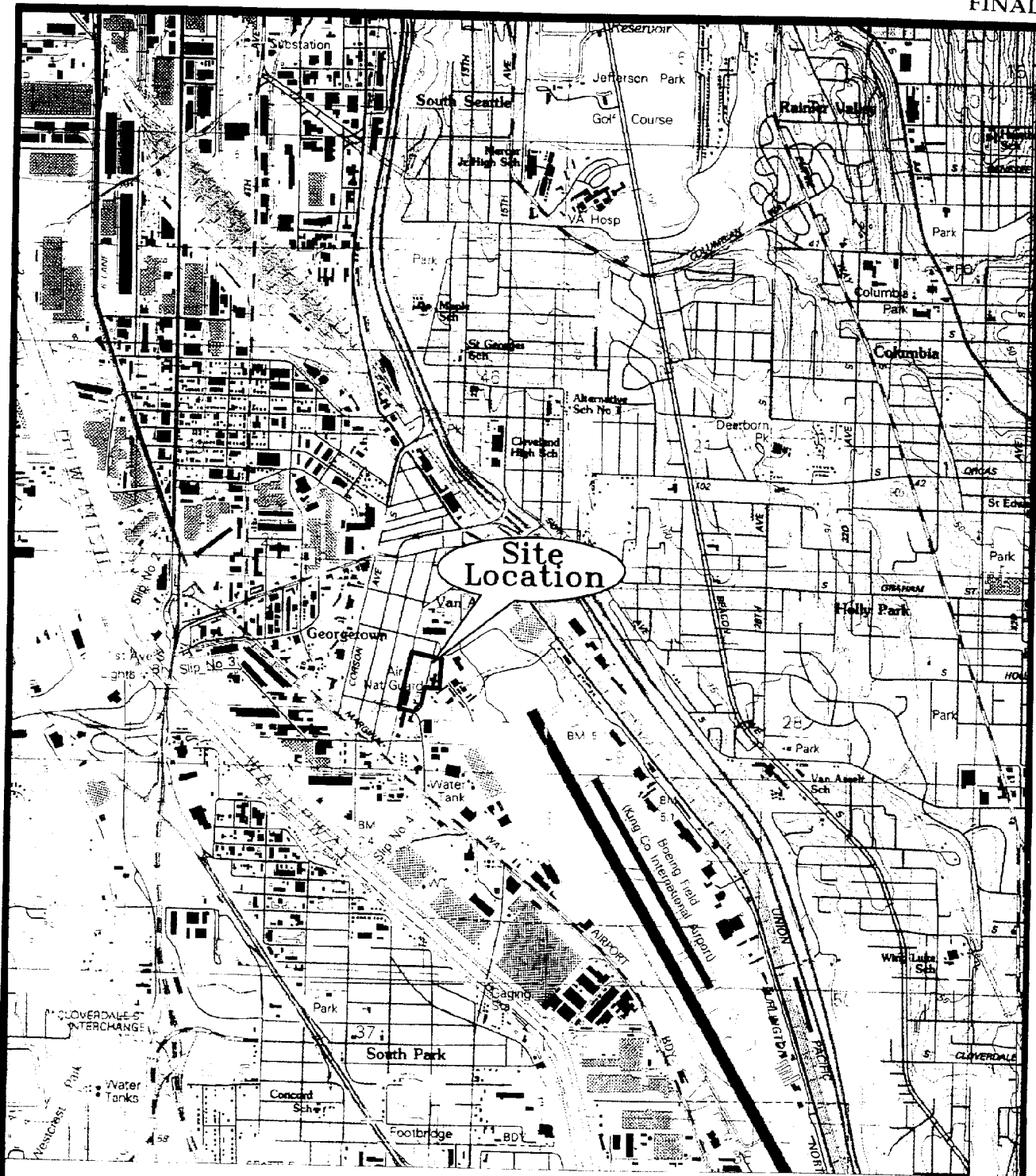
## INTRODUCTION/BACKGROUND

This report summarizes the methods and results of the quarterly groundwater sampling event conducted on 23 and 24 February 2000 at the Seattle Air National Guard Station (Seattle ANGS) in Seattle, Washington (Figure 1-1). Groundwater monitoring has been conducted at the site since September 1996 as part of the Air National Guard (ANG) Installation Restoration Program (IRP). Environmental Resources Management (ERM) performed the work under National Guard Bureau Contract DAHA90-94-D-0014, Delivery Order 0067. The Air National Guard/Installation Restoration Program Branch provided technical and project management oversight of the work.

The Seattle ANGS is at 6736 Ellis Avenue South in Seattle, Washington, and occupies approximately 7.5 acres near the north end of the King County International Airport (Boeing Field). A map of the Seattle ANGS is shown in Figure 1-2. The Seattle ANGS is currently the home of the 143rd Combat Communications Squadron (CCSQ). The mission of the 143rd CCSQ is to provide mobile communication equipment and support for airports and airfields. The facility employs approximately 129 personnel, of which 25 are full-time employees.

The Seattle ANGS site was originally developed during World War II by the War Department, and was used by the United States Army Air Corps as an "Aircraft Factory School" from 1943 to 1948. In 1948 the property was given to King County as surplus property and was subsequently leased to the Washington ANG. On 21 April 1948, the 143rd Aircraft Control and Warning Squadron was established on the site. From May 1951 to February 1953, the 143rd was activated for recruitment purposes. During this period the unit had two C-47 aircraft. In 1960 the name of the unit was formally changed to the 143rd Communications Squadron Tributary Teams. In 1969 and 1988 the name of the unit was again changed, becoming the 143rd Mobile Communications Squadron and the 143rd CCSQ, respectively.

Currently, the Seattle ANGS property is leased from King County by the United States Air Force, which in turn licenses the property to the Washington State Military Department for ANG use.



From USGS 7.5 Minute  
Topographic Map Series.  
Seattle South, Washington

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FIGURE 1-1

LOCATION MAP OF SEATTLE  
AIR NATIONAL GUARD STATION  
SEATTLE, WASHINGTON  
143rd CCSQ, Seattle ANG  
Seattle, Washington



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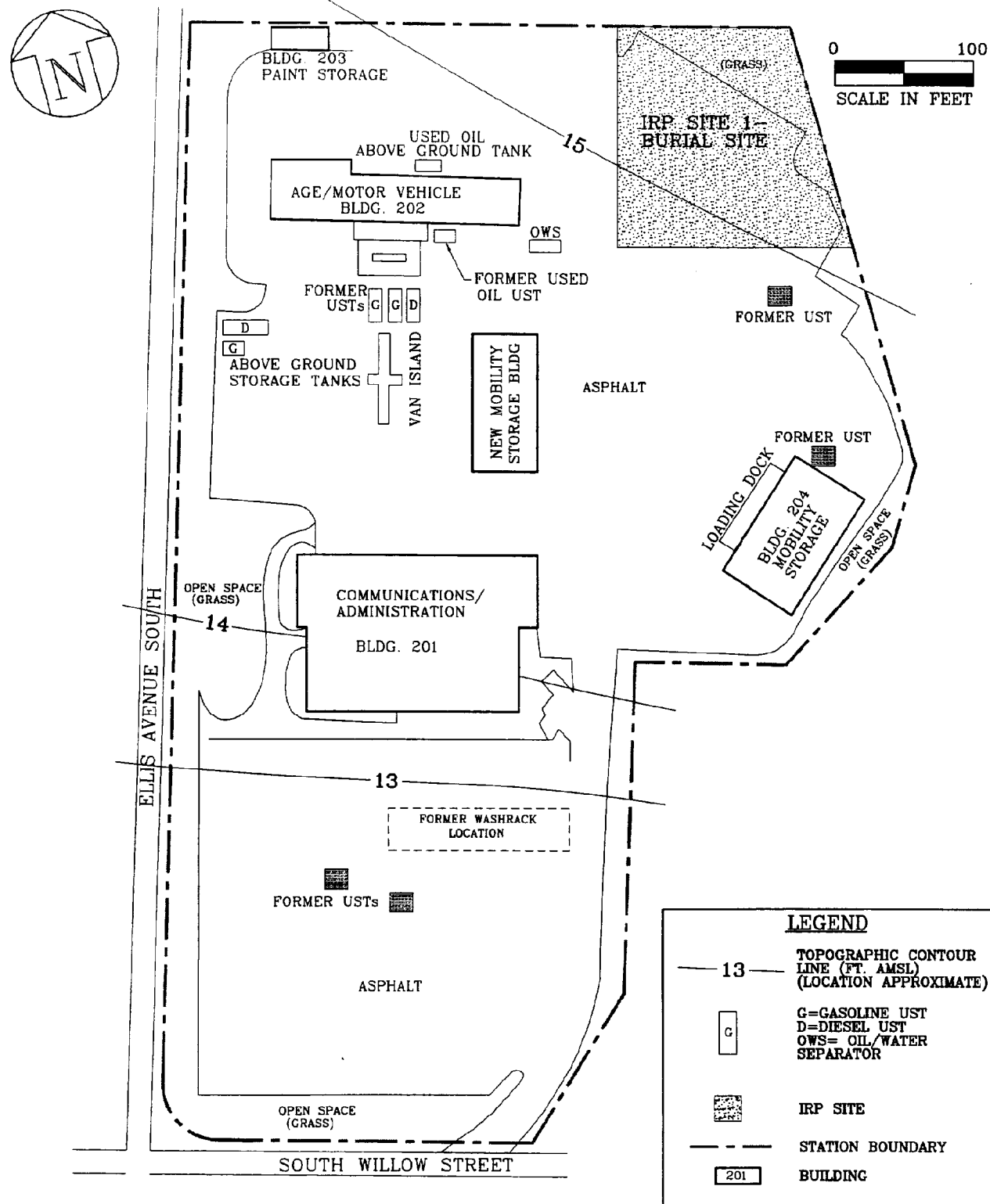


FIGURE 1-2

## SITE MAP

143rd CCSQ, Seattle ANG  
Seattle, Washington



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Three IRP investigation phases have been completed at the Seattle ANGSS:

- A Preliminary Assessment, conducted by the ANG in December 1993;
- A Preliminary Assessment/Site Inspection, conducted by Operational Technologies Corporation in 1994; and
- A two-part Remedial Investigation/Feasibility Study, conducted by ERM between 1996 and 1999.

The scope and results of these IRP investigations are summarized in the Phase II Remedial Investigation (RI) and Feasibility Study Reports (ERM 1999a, 1999b). Numeric project screening goals (PSGs) were developed during the RI for use in identifying contaminants of concern (COCs) in soil and groundwater. The PSGs were derived from chemical-specific State and Federal applicable or relevant and appropriate requirements (ARARs). The derivation of PSGs and the screening process used to identify COCs are described in the Phase II RI Report (ERM 1999a).

Two chlorinated volatile organic compounds (VOCs) - trichloroethene (TCE) and tetrachloroethene (PCE) - have been detected in groundwater at concentrations above PSGs. Isolated detections of PCE have occurred in two background (upgradient) monitoring wells and four site-characterization wells; the majority of the PCE detections have been below the Washington State Model Toxics Control Act (MTCA) Method A Cleanup Level of 5.0 micrograms per liter ( $\mu\text{g/l}$ ). Dissolved TCE in groundwater is the only consistently detected COC at the Seattle ANGSS that may pose a potential threat to human health or the environment. TCE has been detected at concentrations up to 83  $\mu\text{g/l}$  in shallow groundwater in the southern portion of the Station. The MTCA Method A Cleanup Level for TCE is 5.0  $\mu\text{g/l}$ .

An on-site source area for the TCE detected in groundwater has not been identified. Out of 27 soil samples analyzed for VOCs during the RI, only one was found to contain TCE. The TCE concentration reported in this sample (0.17 milligrams per kilogram) was below the MTCA Method A Soil Cleanup Level of 0.5 milligrams per kilogram. Furthermore, this soil sample was collected at the depth of the water table (approximately 10 feet below ground surface) in the southern portion of the Station, and thus may have contained TCE-impacted groundwater that biased the analytical results. Chlorinated VOCs were not detected in any of the other RI soil samples. As discussed in the Phase II RI Report (ERM 1999a), the

groundwater data suggest that the dissolved TCE detected in monitoring wells at the Seattle ANGS may be related to groundwater contamination at the Boeing facility immediately south of the Station. Concentrations of TCE up to 1,300 µg/l have been detected in monitoring wells at the Boeing site.

## SECTION 2.0

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***FIELD ACTIVITIES***

This section provides a summary of field activities performed during the February 2000 quarterly groundwater sampling event. Groundwater sampling was conducted on 23 and 24 February 2000 in accordance with the procedures detailed in the 1999-2000 Groundwater Monitoring Work Plan (ERM 1999c). Figure 2-1 shows the locations of the monitoring wells.

**2.1 Groundwater Sampling**

Groundwater samples were collected and water levels measured in the following monitoring wells: BS-004PZ, BS-005PZ, BS-006PZ, and MW-1 through MW-10. Upgradient wells BS-004PZ and MW-1 at the north end of the Station (Figure 2-1) are considered background wells.

Prior to the collection of groundwater samples, static water levels in the monitoring wells were measured to within  $\pm 0.01$  foot using an electronic water level indicator. Measurements were made from established reference points marked on top of each well casing. The monitoring wells were then purged and sampled using low-flow techniques. Samples were collected for analysis of VOCs.

**2.1.1 Sample Collection Procedures**

Using a bladder pump, each monitoring well was purged at a rate of less than 500 milliliters per minute. The pump was placed between the middle and top of the screened interval in each well. The temperature, acidity/alkalinity (pH), specific conductance, turbidity, and dissolved oxygen content of the purge water were monitored during well purging using an in-line flow cell and portable water quality meter. Purging continued until specific conductance and turbidity (or dissolved oxygen) stabilized to within  $\pm 10$  percent, pH to within  $\pm 0.1$  units, and temperature to within  $\pm 1$  degree Celsius.

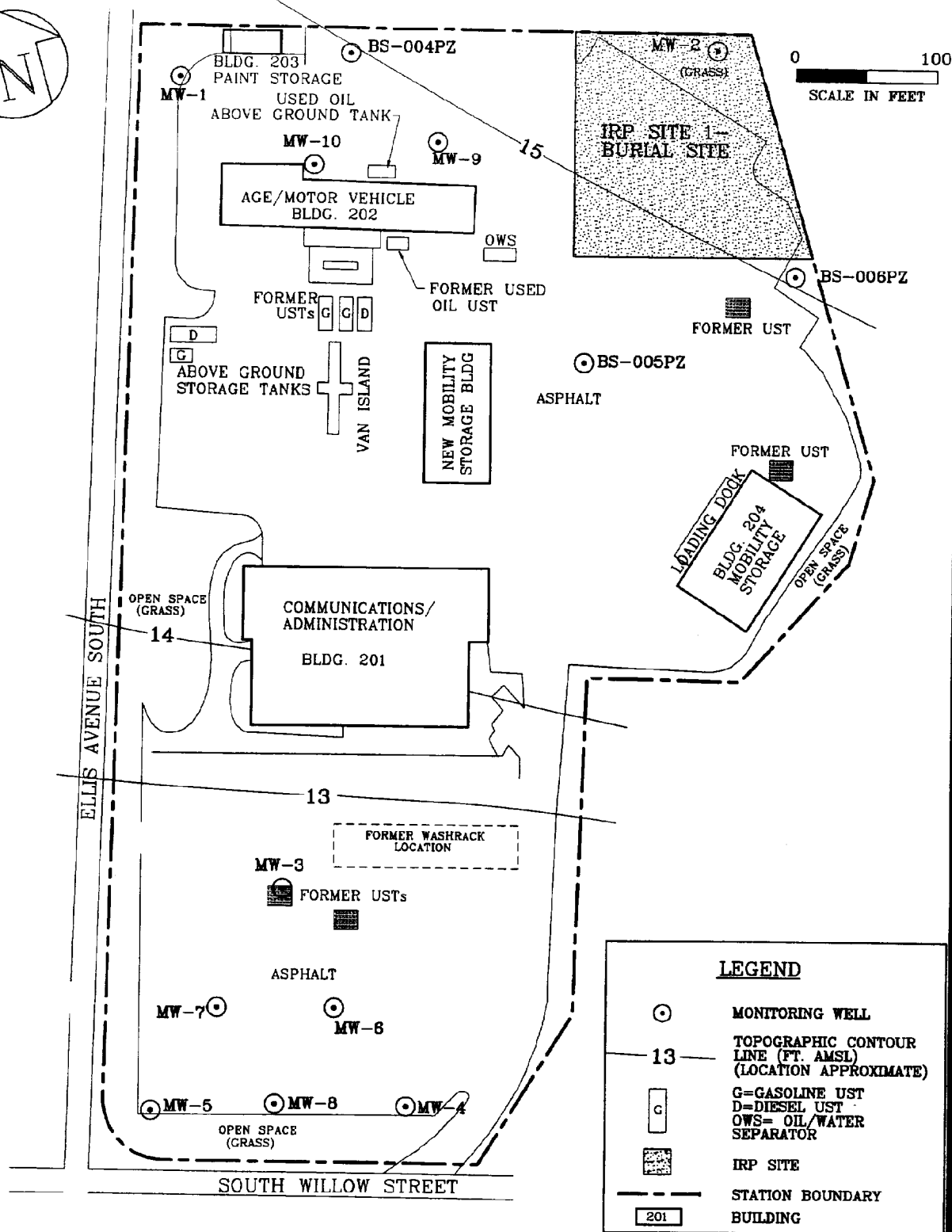


FIGURE 2-1

## GROUNDWATER MONITORING WELL LOCATIONS

143rd CCSQ, Seattle ANG  
Seattle, Washington



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After each monitoring well was purged, groundwater samples were collected using the submersible pump. The samples were collected in 40-milliliter glass vials with Teflon-lined septum lids and preserved with hydrochloric acid. Immediately following sample collection, the groundwater samples were labeled and placed in coolers containing ice. The samples were delivered to the analytical laboratory under chain of custody.

A fresh length of disposable polyethylene pump-discharge tubing was used at each monitoring well. Reusable sampling equipment was decontaminated before and after use at each well. The electronic water level indicator and the bladder pump housing were washed with an aqueous solution of Liqui-Nox (a laboratory-grade detergent) followed by a tap water rinse, a rinse with American Society for Testing and Materials (ASTM) Type II reagent-grade water, and a final spray rinse with isopropanol. The bladder pump internals were decontaminated by pouring a Liqui-Nox solution, followed by tap water and ASTM Type II water, through the pump. The ASTM Type II water was produced on-site from Station tap water using a portable water filtration system.

### **2.1.2 Field QA/QC Sampling**

In addition to the primary groundwater samples collected from 13 groundwater monitoring wells, the following quality assurance/quality control (QA/QC) samples were collected and/or prepared:

- One equipment rinsate blank and two field blanks. ASTM Type II water was used to prepare the rinsate blank; field blanks were prepared from tap water and ASTM Type II water. The sample identifiers for the blank samples consisted of the identifier for the primary sample collected immediately prior to the blank, followed by an "R" for the rinsate blank, an "FT" for the tap water field blank, and an "FA" for the ASTM Type II water field blank.
- One duplicate sample from monitoring well MW-8. The sample identifier for the field duplicate sample was the same as the associated primary sample, followed by a "D".
- One sample for matrix spike/matrix spike duplicate analysis. The sample collected from monitoring well MW-8 was designated for the matrix spike/matrix spike duplicate analysis.

- One trip blank. The trip blank was prepared by the laboratory using reagent water, and accompanied the sample containers in the cooler in transit to the field and back to the laboratory.

### **2.1.3 Groundwater Sample Analyses**

The groundwater samples were analyzed for VOCs using United States Environmental Protection Agency (USEPA) Method 8260. MultiChem Analytical Services in Renton, Washington performed the analyses. A summary of the samples submitted for laboratory analysis is shown in Table 2-1.

## **2.2 Investigation-Derived Waste Management**

Purge water and decontamination water was collected and stored in a 55-gallon drum. The groundwater analytical results were used to designate the drum contents as dangerous or non-dangerous waste in accordance with Washington State Dangerous Waste Regulations, Washington Administrative Code Chapter 173-303.

The purge water and decontamination water was determined not to be a Washington-defined dangerous waste. Accordingly, the purge water and decontamination water can be discharged to the sanitary sewer if approved by the local publicly owned treatment works (King County Department of Natural Resources, Wastewater Division). Alternatively, the purge water and decontamination water may be disposed at a facility that is permitted to receive and dispose of industrial wastewater, or at a permitted dangerous waste treatment, storage, and disposal facility.

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TABLE 2-1

*Summary of Groundwater Samples and Analytical Methods, February 2000  
143rd CCSQ, Seattle ANG, Seattle, Washington*

Matrix	Sampling Method/Locations	Field Parameters	Laboratory Parameters	Analytical Method	Primary Sample Analyses	QA/QC Samples					Total Laboratory Analyses
						Trip Blank	Rinsate Blank	Field Blank	Field Duplicate	MS/MSD	
Groundwater	Low-flow sampling; 13 monitoring wells	S.C., Turbidity, pH, Temperature, D.O.	VOCs	USEPA 8260	13	1	1	2	1	1	19

**Notes:**

D.O. = Dissolved oxygen content

MS/MSD = Matrix spike/matrix spike duplicate

pH = Acidity/alkalinity

QA/QC = Quality assurance/quality control

S.C. = Specific conductance

USEPA = United States Environmental Protection Agency

VOC = Volatile organic compound

## SECTION 3.0

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**RESULTS**

This section summarizes the results of the February 2000 groundwater sampling event at the Seattle ANGS.

**3.1 Groundwater Level Data Results**

---

Static water levels measured in the monitoring wells on 23 February 2000 ranged from approximately 6 to 9 feet below ground surface. Depth measurements were converted to groundwater elevations by subtracting the measured depth to water in each well from the known elevation of the wellhead (top of well casing). A potentiometric surface map generated from the groundwater elevation data is presented in Figure 3-1. The inferred groundwater flow direction was toward the south-southwest, consistent with previous measurements. Cumulative water level data for the Seattle ANGS monitoring wells are included in Appendix A.

**3.2 Field Parameter Results**

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Before groundwater samples were collected from each monitoring well, the well was purged until field parameter measurements stabilized. The final field parameter measurements are summarized in Table 3-1.

**3.3 Analytical Results**

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The analytical testing results for the February 2000 groundwater samples are summarized in Table 3-2. Table 3-2 also includes the results for groundwater samples collected during the RI and previous quarterly sampling events, and the PSGs derived from chemical-specific ARARs. The analytical testing results for the field QC blank samples are summarized in Table 3-3.

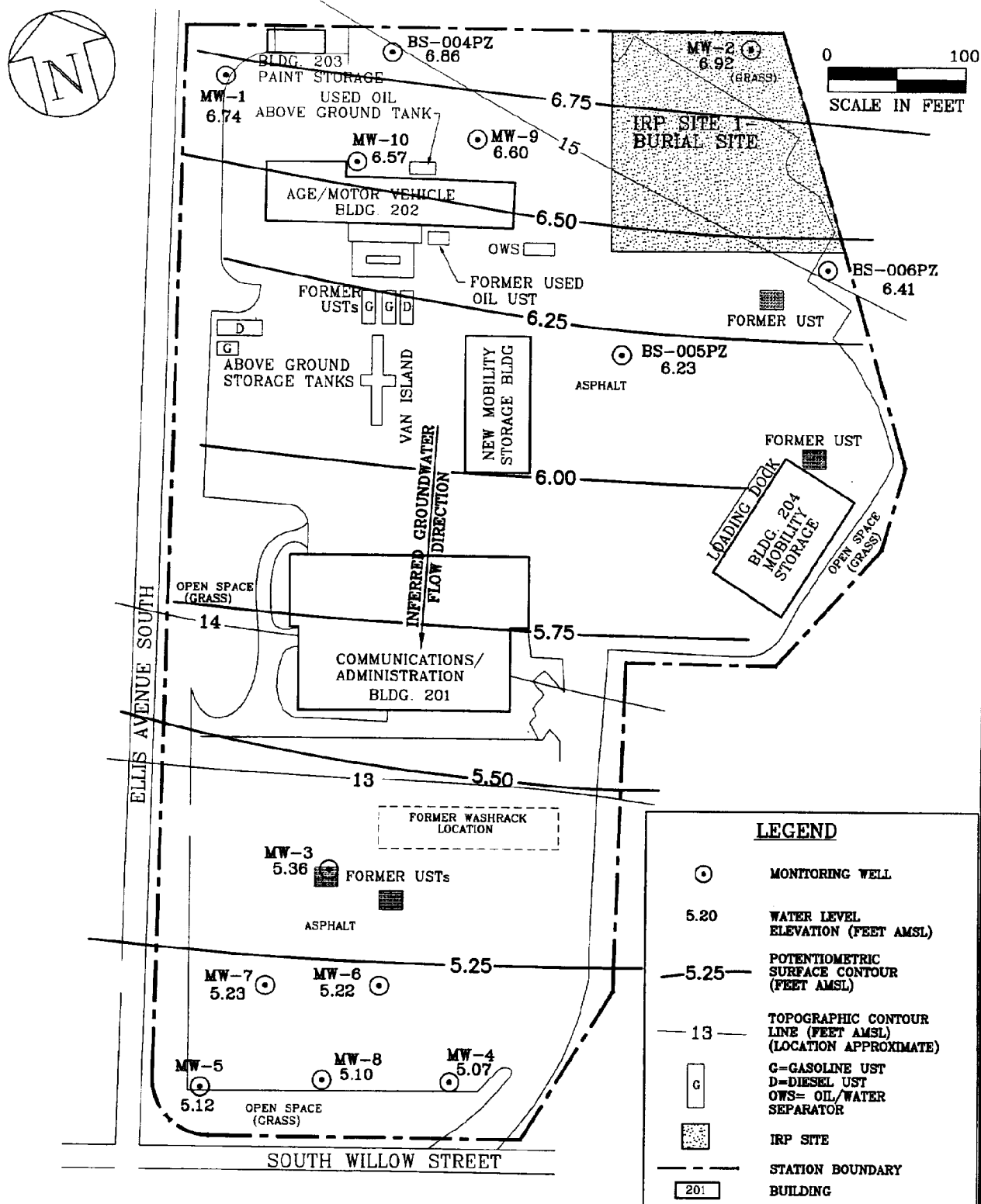


FIGURE 3-1

# POTENTIOMETRIC SURFACE MAP 23 FEBRUARY 2000

143rd CCSQ, Seattle ANG  
Seattle, Washington



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**TABLE 3-1**  
*Final Field Parameter Measurements During Monitoring Well Purging, February 2000*  
*143rd CCSQ, Seattle ANG, Seattle, Washington*

Monitoring Well	Field Parameters				
	Temperature (Degrees Celsius)	pH	Specific Conductance ( $\mu$ S/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)
BS-004PZ (Background Well)	11.2	5.31	112	860	7.40
BS-005PZ	13.7	5.63	231	3.6	0.83
BS-006PZ	13.0	5.60	214	39	3.07
MW-1 (Background Well)	14.0	5.54	204	3.2	0.99
MW-2	13.3	5.30	158	0.6	2.66
MW-3	13.2	5.67	233	14	1.77
MW-4	14.5	5.76	282	49	1.30
MW-5	12.8	5.70	307	4.1	1.01
MW-6	14.8	5.77	199	38	3.19
MW-7	13.6	5.44	442	160	5.93
MW-8	12.1	5.81	266	330	7.15
MW-9	12.2	5.65	217	35	7.30
MW-10	12.6	5.97	175	17	7.98

g/l = grams per liter

mg/l = milligram per liter

mV = millivolts

Notes:

$\mu$ S/cm= Microsiemens per centimeter

mg/l = Milligrams per liter

NTU = Nephelometric turbidity units

pH = Acidity/alkalinity

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TABLE 3-2

*Organic Constituents Detected in Groundwater Monitoring Wells  
143rd CCSQ, Seattle ANG, Seattle, Washington*

Location	Date	Acetone	Toluene	1,1-Dichloroethane	1,1,1-Trichloroethane	cis-1,2-Dichloroethene	1,3,5-Trimethylbenzene	Trichloroethene	Tetrachloroethene
BS-004PZ (Background Well)	09/17/1996	ND	(ND)	0.3	3.7	ND	ND	ND	3.8
	9/17/96 (dup)	ND	(ND)	0.3	3.8	ND	ND	ND	3.8
	01/14/1997	ND	ND	ND	2.4	ND	ND	ND	5.1
	04/11/1997	ND	ND	ND	3.3	ND	ND	ND	17
	07/10/1997	ND	ND	ND	1.8	ND	ND	ND	(ND)
	09/02/1998	ND	ND	ND	ND	ND	NA	ND	2.0
	11/25/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/19/1999	ND	ND	ND	ND	ND	NA	ND	6.8
	08/25/1999	ND	ND	ND	ND	ND	NA	ND	ND
BS-005PZ	11/23/1999	ND	ND	ND	ND	ND	NA	ND	3.1
	02/23/2000	ND	ND	ND	ND	ND	NA	ND	4.1
	09/17/1996	ND	ND	ND	ND	ND	0.2	ND	ND
	01/15/1997	ND	ND	ND	ND	ND	ND	ND	ND
	04/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	07/11/1997	ND	ND	ND	ND	ND	ND	ND	4.7
	09/01/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/25/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	ND	ND
BS-006PZ	08/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	11/23/1999	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/2000	ND	ND	ND	ND	ND	NA	ND	ND
	09/17/1996	ND	ND	ND	ND	ND	0.2	ND	ND
	01/14/1997	ND	ND	ND	ND	ND	ND	ND	ND
	04/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	07/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	11/23/1999	ND	ND	ND	ND	ND	NA	ND	ND
	02/23/2000	ND	ND	ND	ND	ND	NA	ND	ND

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TABLE 3-2

Organic Constituents Detected in Groundwater Monitoring Wells  
143rd CCSQ, Seattle ANG, Seattle, Washington

Location	Date	Acetone	Toluene	1,1-Dichloroethane	1,1,1-Trichloroethane	cis-1,2-Dichloroethene	1,3,5-Trimethylbenzene	Trichloroethene	Tetrachloroethene
MW-1 (Background Well)	10/18/1996	ND	ND	ND	ND	ND	ND	ND	ND
	12/17/1996	ND	ND	ND	ND	ND	ND	ND	ND
	01/14/1997	ND	1.1	ND	ND	ND	ND	ND	ND
	04/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	07/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	09/01/1998	ND	6.0	ND	ND	ND	NA	ND	ND
	11/25/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	5.2
	05/19/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/25/1999	ND	ND	ND	ND	ND	NA	ND	ND
	11/23/1999	ND	ND	ND	ND	ND	NA	ND	ND
	02/23/2000	ND	ND	ND	ND	ND	NA	ND	ND
MW-2	10/18/1996	ND	ND	ND	ND	ND	ND	ND	ND
	12/17/1996	ND	ND	ND	ND	ND	ND	ND	ND
	01/15/1997	ND	ND	ND	ND	ND	ND	ND	ND
	1/15/97 (dup)	ND	ND	ND	ND	ND	ND	ND	ND
	04/10/1997	ND	ND	ND	ND	ND	ND	ND	ND
	07/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/25/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	11/23/1999	ND	ND	ND	ND	ND	NA	ND	ND
	02/23/2000	ND	ND	ND	ND	ND	NA	ND	ND
MW-3	10/18/1996	18	ND	ND	ND	ND	ND	ND	ND
	10/18/96 (dup)	20	ND	ND	ND	ND	ND	ND	ND
	12/17/1996	ND	ND	ND	ND	ND	ND	ND	ND
	12/17/96 (dup)	ND	ND	ND	ND	ND	ND	ND	ND
	01/15/1997	ND	ND	ND	ND	ND	ND	ND	ND
	04/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	07/11/1997	ND	ND	ND	ND	ND	ND	ND	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	ND	ND
	9/2/98 (dup)	ND	ND	ND	ND	ND	NA	ND	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/24/98 (dup)	ND	ND	ND	ND	ND	NA	ND	ND
	02/25/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	ND	1.2
	11/23/1999	ND	ND	ND	ND	ND	NA	ND	ND
	02/23/2000	ND	ND	ND	ND	ND	NA	ND	ND



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TABLE 3-2

*Organic Constituents Detected in Groundwater Monitoring Wells  
143rd CCSQ, Seattle ANG, Seattle, Washington*

Location	Date	Acetone	Toluene	1,1-Dichloroethane	1,1,1-Trichloroethane	cis-1,2-Dichloroethene	1,3,5-Trimethylbenzene	Trichloroethene	Tetrachloroethene
MW-4	10/18/1996	11	ND	ND	ND	ND	ND	3.9	ND
	12/17/1996	ND	ND	ND	ND	ND	ND	2.7	ND
	01/14/1997	ND	ND	ND	ND	ND	ND	3.4	ND
	04/11/1997	ND	ND	ND	ND	ND	ND	3.2	ND
	07/11/1997	ND	ND	ND	ND	ND	ND	2.8	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	2.0	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	3.4	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	2.6	ND
	2/24/99 (dup)	ND	ND	ND	ND	ND	NA	2.6	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	2.9	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	3.3	ND
	11/24/1999	ND	ND	ND	ND	ND	NA	2.4	ND
MW-5	02/24/2000	ND	ND	ND	ND	ND	NA	2.9	ND
	10/18/1996	ND	ND	ND	ND	5.6	ND	ND	ND
	12/17/1996	ND	ND	ND	ND	4.9	ND	ND	ND
	01/14/1997	ND	ND	ND	ND	2.7	ND	ND	ND
	04/11/1997	ND	ND	ND	ND	1.4	ND	ND	ND
	4/11/97 (dup)	ND	ND	ND	ND	1.6	ND	ND	ND
	07/10/1997	ND	ND	ND	ND	3.5	ND	2.1	(ND)
	7/10/97 (dup)	ND	ND	ND	ND	2.8	ND	ND	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/24/1998	ND	ND	ND	ND	3.2	NA	ND	ND
	02/25/1999	ND	ND	ND	ND	1.7	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	11/23/1999	ND	ND	ND	ND	2.2	NA	ND	ND
MW-6	02/24/2000	ND	ND	ND	ND	2.5	NA	ND	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	3.0	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	3.0	ND
	02/25/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	1.0	NA	5.7	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	3.5	ND
	11/23/1999	ND	ND	ND	ND	ND	NA	2.9	ND
MW-7	02/24/2000	ND	ND	ND	ND	1.0	NA	4.3	ND
	09/02/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	3.8	ND
	02/25/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	1.9	1.7
	11/23/1999	ND	ND	ND	ND	ND	NA	1.5	ND
	02/24/2000	ND	ND	ND	ND	ND	NA	ND	ND

3-6

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TABLE 3-2

*Organic Constituents Detected in Groundwater Monitoring Wells  
143rd CCSQ, Seattle ANG, Seattle, Washington*

Location	Date	Acetone	Toluene	1,1-Dichloroethane	1,1,1-Trichloroethane	cis-1,2-Dichloroethene	1,3,5-Trimethylbenzene	Trichloroethene	Tetrachloroethene
MW-8	09/02/1998	ND	ND	ND	ND	ND	NA	3.0	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	3.3	ND
	02/24/1999	ND	ND	ND	ND	39	NA	83	ND
	2/24/99 (dup)	ND	ND	ND	ND	42	NA	87	ND
	05/18/1999	ND	ND	ND	ND	4.5	NA	19	ND
	5/18/99 (dup)	ND	ND	ND	ND	4.7	NA	21	ND
	08/24/1999	ND	ND	ND	ND	ND	NA	7.2	ND
	8/24/99 (dup)	ND	ND	ND	ND	ND	NA	6.7	ND
	11/24/1999	ND	ND	ND	ND	ND	NA	4.2	ND
	11/24/99 (dup)	ND	ND	ND	ND	ND	NA	4.3	ND
MW-9	02/24/2000	ND	ND	ND	ND	5.8	NA	12	ND
	2/24/00 (dup)	ND	ND	ND	ND	6.1	NA	14	ND
	09/01/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/24/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/18/1999	ND	ND	ND	1.4	ND	NA	ND	1.8
	08/24/1999	ND	ND	ND	2.0	ND	NA	ND	1.9
MW-10	11/23/1999	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/2000	ND	ND	ND	1.2	ND	NA	ND	ND
	09/01/1998	ND	ND	ND	ND	ND	NA	ND	ND
	11/25/1998	ND	ND	ND	ND	ND	NA	ND	ND
	02/24/1999	ND	ND	ND	ND	ND	NA	ND	ND
	05/19/1999	ND	ND	ND	ND	ND	NA	ND	ND
	08/25/1999	ND	ND	ND	ND	ND	NA	ND	ND
RI Project Screening Goal		800	40	800	200	70	0.507	5.0	5.0

All concentrations in micrograms per liter (µg/l)

ND = Not detected above laboratory method reporting limit

(ND) = A positive detection was reported by the laboratory for this constituent in the sample indicated. The sample result was qualified as not detected based on a detection of the constituent in an associated quality control blank (United States Environmental Protection Agency Contract Laboratory Program "10x" and "5x" rules).

NA = Not analyzed

dup = Duplicate sample

RI = Remedial Investigation

Shaded cell/bold typeface indicates a value exceeding the associated RI project screening goal.

FINAL

TABLE 3-3

*Constituents Detected in Field Quality Control Blank Samples, February 2000  
143rd CCSQ, Seattle ANG, Seattle, Washington*

Type	Date	Sample Number	Volatile Organic Compounds	
			Bromo- dichloromethane	Chloroform
Field Blank (Tap Water)	02/24/00	MW-4-99/00-3FT	1.1	30
Field Blank (ASTM Type II Water)	02/24/00	MW-4-99/00-3FA	ND	ND
Rinsate Blank	02/24/00	MW-8-99/00-3R	ND	ND
Trip Blank	02/23/00	TB022300-1	ND	ND

**Notes:**

Concentrations in micrograms per liter (µg/l).

ASTM = American Society for Testing and Materials

ND = Not detected above laboratory method reporting limit.

Copies of the laboratory data summary sheets are included in Appendix B. The QC Data Validation Report is included in Appendix C. Appendix D contains copies of the Chain-of-Custody Forms.

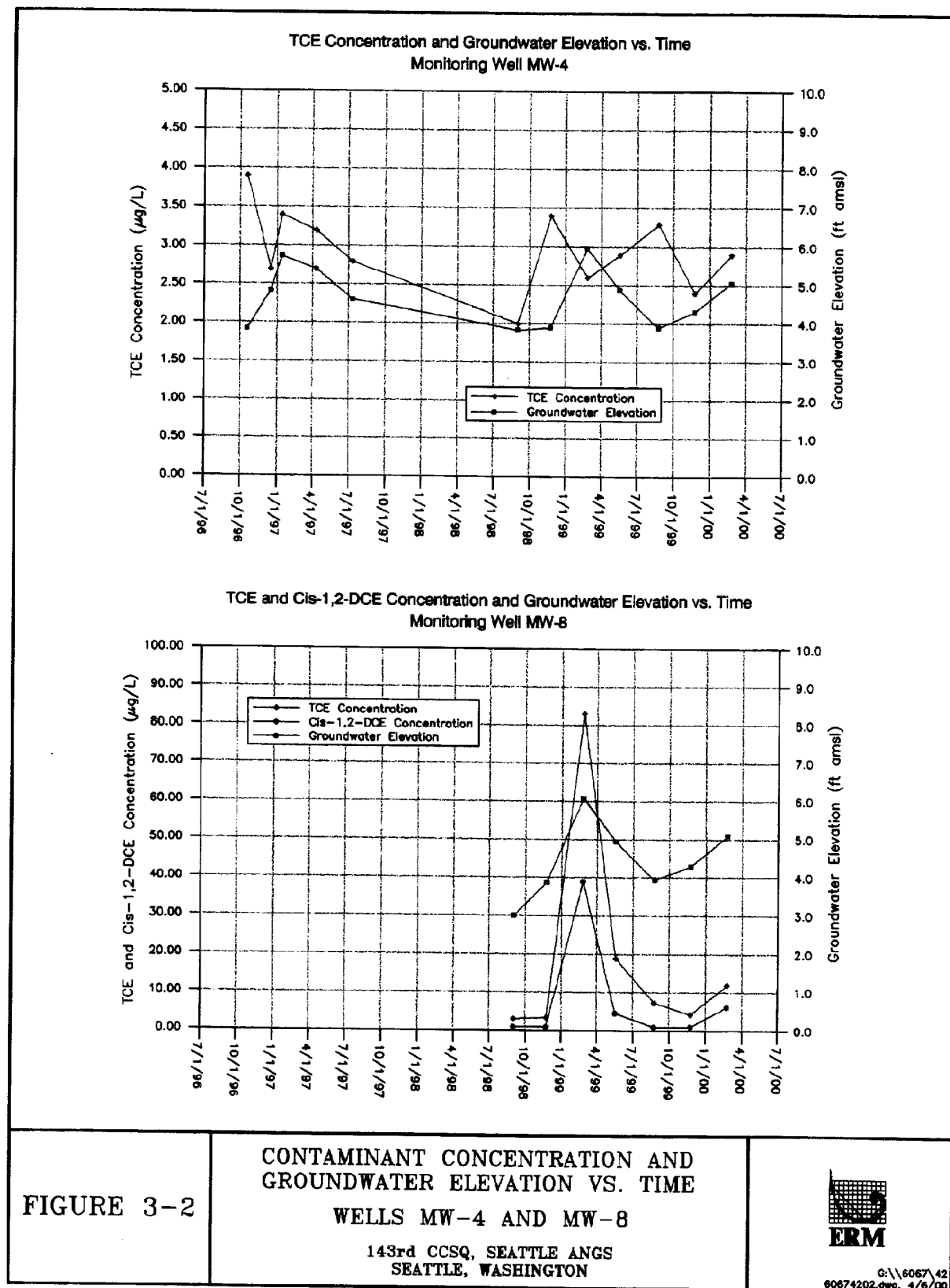
### **3.3.1 Groundwater Samples**

TCE (12 µg/l) was detected above the PSG in the groundwater sample collected from monitoring well MW-8, and below the PSG in the samples collected from wells MW-4 and MW-6. PCE was detected below the PSG in the groundwater sample collected from well BS-004PZ. Cis-1,2-dichloroethene (cis-1,2-DCE) was detected below the PSG in the groundwater samples collected from wells MW-5, MW-6, and MW-8. 1,1,1-Trichloroethane was detected below the PSG in the groundwater sample collected from well MW-9.

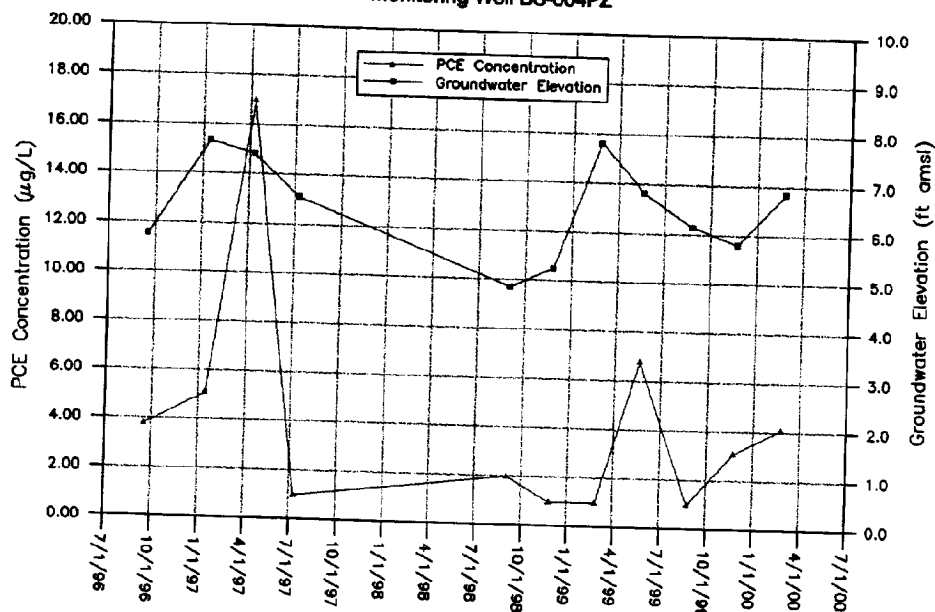
Time series plots of groundwater elevation and TCE, PCE, and cis-1,2-DCE concentrations were produced for wells BS-004PZ, MW-4, MW-5, and MW-8 to determine whether measured contaminant concentrations correlate with groundwater fluctuations beneath the Station. The time series plots are shown in Figures 3-2 and 3-3. Portions of the data for wells MW-4 and MW-8 indicate an apparent correlation between contaminant concentration and groundwater elevation (Figure 3-2). There may also be a correlation in the data for wells MW-5 and BS-004PZ, but this is less apparent.

### **3.3.2 Field QC Blank Samples**

Field QC blank samples (Table 3-3) were analyzed for the same parameters as the associated groundwater samples. Chloroform and bromodichloromethane were detected in the tap water field blank produced from Station water. These compounds are common residual byproducts of the drinking water chlorination process. Chloroform and bromodichloromethane were not detected in any groundwater samples.



PCE Concentration and Groundwater Elevation vs. Time  
Monitoring Well BS-004PZ



Cis-1,2-DCE Concentration and Groundwater Elevation vs. Time  
Monitoring Well MW-5

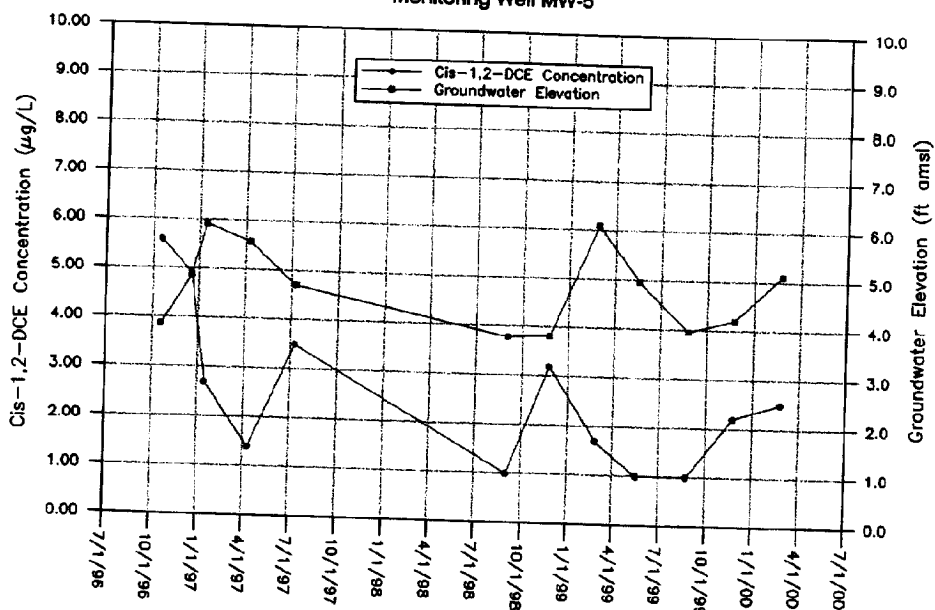


FIGURE 3-3

CONTAMINANT CONCENTRATION AND  
GROUNDWATER ELEVATION VS. TIME  
WELLS BS-004PZ AND MW-5

143rd CCSQ, SEATTLE ANG  
SEATTLE, WASHINGTON



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## SECTION 4.0

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**CONCLUSIONS**

Groundwater samples collected at the Seattle ANGS in February 2000 were analyzed for VOCs. The chlorinated compounds PCE, TCE, cis-1,2-DCE, and/or 1,1,1-trichloroethane were detected in select monitoring wells near the southern Station boundary and at the north end of the Station. With the exception of the TCE concentration reported in well MW-8 (12 µg/l), these compounds were detected at concentrations below Washington MTCA Method A Cleanup Levels.

Time series plots of contaminant concentration versus groundwater elevation were produced for monitoring wells BS-004PZ, MW-4, MW-5, and MW-8. Portions of the data for wells MW-4 and MW-8 indicate an apparent correlation between dissolved contaminant concentrations and temporal water table fluctuations. This correlation is less apparent in wells MW-5 and BS-004PZ.

The source of the chlorinated VOCs detected in groundwater has not been identified. Observed TCE concentrations in monitoring wells MW-4 and MW-8 appear to depend in part on groundwater elevation, which suggests that there may be a residual contaminant source (e.g., sorbed-phase VOCs) in soils near the water table proximal to these wells. As discussed in the Phase II RI Report (ERM 1999a), the TCE detected in monitoring wells in the southern portion of the Station may be related to the dissolved TCE plume beneath the Boeing facility immediately south of the Seattle ANGS.

SECTION 5.0

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**REFERENCES**

- Environmental Resources Management (ERM). 1999a. *Installation Restoration Program Final Phase II Remedial Investigation Report, 143rd Combat Communications Squadron, Seattle Air National Guard Station*. August 1999.
- \_\_\_\_\_. 1999b. *Installation Restoration Program Final Phase II Feasibility Study Report, 143rd Combat Communications Squadron, Seattle Air National Guard Station*. August 1999.
- \_\_\_\_\_. 1999c. *Installation Restoration Program Final 1999-2000 Groundwater Monitoring Work Plan, 143rd Combat Communications Squadron, Seattle Air National Guard Station*. September 1999.



**Appendix A**

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**APPENDIX A**

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***WATER LEVEL DATA***

TABLE A-1

*Monitoring Well Water Level Summary*  
 143rd CCSQ, Seattle ANG, Seattle, Washington

Monitoring Well	Measuring Point Elevation (ft amsl)	Date	Depth to Water (ft bmp)	Water Level Elevation (ft amsl)
BS-004PZ (Background Well)	14.66	9/17/96	8.88	5.78
		10/22/96	8.93	5.73
		12/17/96	8.08	6.58
		1/14/97	6.98	7.68
		4/11/97	7.23	7.43
		7/10/97	8.08	6.58
		9/1/98	9.79	4.87
		11/24/98	9.39	5.27
		02/24/99	6.84	7.82
		05/18/99	7.81	6.85
		08/25/99	8.50	6.16
		11/23/99	8.84	5.82
		02/23/00	7.80	6.86
BS-005PZ	14.39	9/17/96	9.16	5.23
		10/22/96	9.42	4.97
		12/17/96	8.51	5.88
		1/15/97	7.48	6.91
		4/10/97	7.65	6.74
		7/11/97	8.47	5.92
		9/1/98	10.12	4.27
		11/24/98	9.41	4.98
		02/24/99	7.32	7.07
		05/18/99	8.15	6.24
		08/24/99	9.19	5.20
		11/23/99	9.13	5.26
		02/23/00	8.16	6.23
BS-006PZ	14.59	9/17/96	9.12	5.47
		10/22/96	9.47	5.12
		12/17/96	8.54	6.05
		1/14/97	7.62	6.97
		4/11/97	7.77	6.82
		7/11/97	8.49	6.10
		9/1/98	10.29	4.30
		11/24/98	9.37	5.22
		02/24/99	7.42	7.17
		05/28/99	8.20	6.39
		08/24/99	9.16	5.43
		11/23/99	9.10	5.49
		02/23/00	8.18	6.41

**TABLE A-1**  
**Monitoring Well Water Level Summary**  
**143rd CCSQ, Seattle ANG, Seattle, Washington**

Monitoring Well	Measuring Point Elevation (ft amsl)	Date	Depth to Water (ft bmp)	Water Level Elevation (ft amsl)
MW-1 (Background Well)	14.92	10/22/96	9.18	5.74
		12/17/96	8.20	6.72
		1/14/97	7.11	7.81
		4/10/97	7.58	7.34
		7/11/97	8.51	6.41
		9/1/98	10.22	4.70
		11/24/98	9.45	5.47
		02/24/99	7.12	7.80
		05/18/99	8.25	6.67
		08/25/99	8.78	6.14
		11/23/99	9.23	5.69
		02/23/00	8.18	6.74
MW-2	14.60	10/22/96	8.89	5.71
		12/17/96	8.03	6.57
		1/15/97	7.13	7.47
		4/10/97	7.25	7.35
		7/11/97	7.98	6.62
		9/1/98	9.59	5.01
		11/24/98	9.75	4.85
		02/24/99	6.70	7.90
		05/18/99	7.71	6.89
		08/24/99	8.68	5.92
		11/23/99	8.67	5.93
		02/23/00	7.68	6.92
MW-3	11.88	10/22/96	7.77	4.11
		12/17/96	6.78	5.10
		1/15/97	7.80	4.08
		4/11/97	6.06	5.82
		7/11/97	6.94	4.94
		9/1/98	8.09	3.79
		11/24/98	7.20	4.68
		02/24/99	5.56	6.32
		05/18/99	6.65	5.23
		08/24/99	7.05	4.83
		11/23/99	7.43	4.45
		02/23/00	6.52	5.36

TABLE A-1

*Monitoring Well Water Level Summary*  
 143rd CCSQ, Seattle ANG, Seattle, Washington

Monitoring Well	Measuring Point Elevation (ft amsl)	Date	Depth to Water (ft bmp)	Water Level Elevation (ft amsl)
MW-4	12.05	10/22/96	8.20	3.85
		12/17/96	7.21	4.84
		1/14/97	6.31	5.74
		4/11/97	6.65	5.40
		7/11/97	7.43	4.62
		9/1/98	8.21	3.84
		11/24/98	8.14	3.91
		02/24/99	6.08	5.97
		05/18/99	7.16	4.89
		08/24/99	8.14	3.91
		11/24/99	7.73	4.32
		02/23/00	6.98	5.07
MW-5	13.94	10/22/96	10.06	3.88
		12/17/96	9.06	4.88
		1/14/97	8.01	5.93
		4/11/97	8.36	5.58
		7/10/97	9.23	4.71
		9/1/98	10.15	3.79
		11/24/98	10.11	3.83
		02/24/99	7.84	6.10
		05/18/99	8.98	4.96
		08/24/99	9.97	3.97
		11/23/99	9.74	4.20
		02/23/00	8.82	5.12
MW-6	11.62	9/1/98	8.38	3.24
		11/24/98	7.64	3.98
		02/24/99	5.50	6.12
		05/18/99	6.55	5.07
		08/24/99	7.54	4.08
		11/23/99	7.28	4.34
		02/23/00	6.40	5.22
MW-7	12.17	9/1/98	6.75	5.42
		11/24/98	7.30	4.87
		02/24/99	5.94	6.23
		05/18/99	7.05	5.12
		08/24/99	8.08	4.09
		11/23/99	7.85	4.32
		02/23/00	6.94	5.23

FINAL

TABLE A-1

*Monitoring Well Water Level Summary  
143rd CCSQ, Seattle ANGS, Seattle, Washington*

Monitoring Well	Measuring Point Elevation (ft amsl)	Date	Depth to Water (ft bmp)	Water Level Elevation (ft amsl)
MW-8	11.90	9/1/98	8.89	3.01
		11/24/98	8.02	3.88
		02/24/99	5.82	6.08
		05/18/99	6.95	4.95
		08/24/99	7.95	3.95
		11/24/99	7.59	4.31
		02/23/00	6.80	5.10
MW-9	14.30	9/1/98	9.78	4.52
		11/24/98	8.00	6.30
		02/24/99	6.76	7.54
		05/18/99	7.69	6.61
		08/24/99	8.42	5.88
		11/23/99	8.43	5.87
		02/23/00	7.70	6.60
MW-10	14.97	9/1/98	10.42	4.55
		11/24/98	9.69	5.28
		02/24/99	7.40	7.57
		05/18/99	8.43	6.54
		08/25/99	9.00	5.97
		11/23/99	9.45	5.52
		02/23/00	8.40	6.57

Notes:

ft amsl = Feet above mean sea level

ft bmp = Feet below measuring point

**Appendix B**

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**APPENDIX B**

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***LABORATORY DATA SUMMARY SHEETS***



MAS I.D. # 002063

March 20, 2000

ERM-West, Inc.  
915 118th Ave. SE  
Suite 130  
Bellevue WA 98005

Attention : Rob Leet


Project Number : 6067.25

Project Name : Seattle Quarterly GW Monitoring

Dear Mr. Leet:

On February 24, 2000, MultiChem Analytical Services received 18 samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

  
Janet M. Cloutier  
Project Manager

JMC/hal/trm

Enclosure

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING

MAS #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
002063-1	BS-006P2-99/00-3	02/23/00	WATER
002063-2	MW-2-99/00-3	02/23/00	WATER
002063-3	MW-1-99/00-3	02/23/00	WATER
002063-4	BS-004P2-99/00-3	02/23/00	WATER
002063-5	MW-3-99/00-3	02/23/00	WATER
002063-6	MW-10-99/00-3	02/24/00	WATER
002063-7	MW-9-99/00-3	02/24/00	WATER
002063-8	BS-005P2-99/00-3	02/24/00	WATER
002063-9	MW-6-99/00-3	02/24/00	WATER
002063-10	MW-7-99/00-3	02/24/00	WATER
002063-11	MW-5-99/00-3	02/24/00	WATER
002063-12	TB022300-1	02/24/00	WATER
002063-13	MW-8-99/00-3	02/24/00	WATER
002063-14	MW-8-99/00-3D	02/24/00	WATER
002063-15	MW-8-99/00-3R	02/24/00	WATER
002063-16	MW-4-99/00-3	02/24/00	WATER
002063-17	MW-4-99/00-3FA	02/24/00	WATER
002063-18	MW-4-99/00-3FT	02/24/00	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	18

MAS STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

ANALYTICAL SCHEDULE

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING

ANALYSIS	TECHNIQUE	REFERENCE	LAB
VOLATILE ORGANICS ANALYSIS	GCMS	EPA 8260B	R

R = MAS - Renton  
ANC = MAS - Anchorage  
SUB = Subcontract

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SEA409281

CASE NARRATIVE

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING

-----  
CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS  
-----

The following anomaly was associated with the preparation and/or analysis of the samples in this accession:

Per client request, initial calibration for all quantified compounds has been performed using average response factors. In all cases, the percent relative standard deviation (%RSD) is <30%. In order to achieve this %RSD criterion, some of the high or low end calibration points may have been eliminated from the initial calibration. However, the initial calibration of all target compounds contains at least five consecutive points over the calibration range, with the low point at or below the reporting limit, and the high point defining the upper limit of the calibration range.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: N/A
PROJECT #	: 6067.25	DATE RECEIVED	: N/A
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: N/A
PROJECT #	: 6067.25	DATE RECEIVED	: N/A
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
-----------	---------

(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	99	81 - 130
TOLUENE-D8	99	80 - 120
BROMOFLUOROBENZENE	100	75 - 118

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: N/A
PROJECT #	: 6067.25	DATE RECEIVED	: N/A
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
-----------	---------

CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: N/A
PROJECT #	: 6067.25	DATE RECEIVED	: N/A
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
-----------	---------

(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	99	81 - 130
TOLUENE-D8	98	80 - 120
BROMOFLUOROBENZENE	96	75 - 118



MAS I.D. # 002063-1

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-006PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS

RESULTS

CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-1

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-006PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
-----------	---------

(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	99	81 - 130
TOLUENE-D8	98	80 - 120
BROMOFLUOROBENZENE	106	75 - 118

MAS I.D. # 002063-2

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
-----------	---------

CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-2-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/23/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L  
DILUTION FACTOR : 1

-----  
COMPOUNDSRESULTS  
-----

(m+p)-XYLENE .....	<1.0
STYRENE .....	<1.0
O-XYLENE .....	<1.0
1,1,2,2-TETRACHLOROETHANE .....	<1.0
1,3-DICHLOROBENZENE .....	<2.0
1,4-DICHLOROBENZENE .....	<2.0
P-ISOPROPYLTOLUENE .....	<2.0
1,2-DICHLOROBENZENE .....	<2.0

## SURROGATE PERCENT RECOVERY

## LIMITS

1,2-DICHLOROETHANE-D4 .....	100	81 - 130
TOLUENE-D8 .....	99	80 - 120
BROMOFLUOROBENZENE .....	107	75 - 118

MAS I.D. # 002063-3

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-1-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/23/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L  
DILUTION FACTOR : 1

-----  
COMPOUNDS

RESULTS  
-----

CHLOROMETHANE .....	<5.0
VINYL CHLORIDE .....	<1.0
BROMOMETHANE .....	<1.0
CHLOROETHANE .....	<1.0
TRICHLOROFLUOROMETHANE .....	<1.0
ACETONE .....	<10
1,1-DICHLOROETHENE .....	<1.0
METHYLENE CHLORIDE .....	<5.0
CARBON DISULFIDE .....	<5.0
TRANS-1,2-DICHLOROETHENE .....	<1.0
1,1-DICHLOROETHANE .....	<1.0
VINYL ACETATE .....	<10
2-BUTANONE .....	<10
CHLOROFORM .....	<1.0
CIS-1,2-DICHLOROETHENE .....	<1.0
1,1,1-TRICHLOROETHANE .....	<1.0
1,2-DICHLOROETHANE .....	<1.0
CARBON TETRACHLORIDE .....	<1.0
BENZENE .....	<1.0
1,2-DICHLOROPROPANE .....	<1.0
TRICHLOROETHENE .....	<1.0
BROMODICHLOROMETHANE .....	<1.0
CIS-1,3-DICHLOROPROPENE .....	<3.0
4-METHYL-2-PENTANONE .....	<10
TRANS-1,3-DICHLOROPROPENE .....	<3.0
1,1,2-TRICHLOROETHANE .....	<1.0
TOLUENE .....	<1.0
CHLORODIBROMOMETHANE .....	<2.0
2-HEXANONE .....	<10
TETRACHLOROETHENE .....	<1.0
CHLOROBENZENE .....	<1.0
ETHYLBENZENE .....	<1.0
BROMOFORM .....	<3.0

MAS I.D. # 002063-3

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
-----------	---------

(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	101	81 - 130
TOLUENE-D8	98	80 - 120
BROMOFLUOROBENZENE	106	75 - 118

MAS I.D. # 002063-4

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-004PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	4.1
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-4

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-004PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	102	81 - 130
TOLUENE-D8	98	80 - 120
BROMOFLUOROBENZENE	106	75 - 118



MAS I.D. # 002063-5

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-3-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-5

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/23/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-3-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	100	81 - 130
TOLUENE-D8	98	80 - 120
BROMOFLUOROBENZENE	105	75 - 118

MAS I.D. # 002063-6

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-10-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-6

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-10-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY		LIMITS
1,2-DICHLOROETHANE-D4	101	81 - 130
TOLUENE-D8	97	80 - 120
BROMOFLUOROBENZENE	104	75 - 118

MAS I.D. # 002063-7

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-9-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS

RESULTS

CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	1.2
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-7

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-9-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	100	81 - 130
TOLUENE-D8	93	80 - 120
BROMOFLUOROBENZENE	105	75 - 118

MAS I.D. # 002063-8

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-005PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-005PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
TRICHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0



MAS I.D. # 002063-8

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: BS-005PZ-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS

RESULTS

(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	100	81 - 130
TOLUENE-D8	90	80 - 120
BROMOFLUOROBENZENE	101	75 - 118

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-6-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	4.3
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-9

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-6-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	101	81 - 130
TOLUENE-D8	91	80 - 120
BROMOFLUOROBENZENE	100	75 - 118

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-7-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-10

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-7-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY		LIMITS
1,2-DICHLOROETHANE-D4	101	81 - 130
TOLUENE-D8	97	80 - 120
BROMOFLUOROBENZENE	104	75 - 118

MAS I.D. # 002063-11

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-5-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	2.5
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-11

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-5-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY		LIMITS
1,2-DICHLOROETHANE-D4	102	81 - 130
TOLUENE-D8	95	80 - 120
BROMOFLUOROBENZENE	103	75 - 118

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: TB022300-1	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0



MAS I.D. # 002063-12

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: TB022300-1	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	100	81 - 130
TOLUENE-D8	98	80 - 120
BROMOFLUOROBENZENE	101	75 - 118

MAS I.D. # 002063-13

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-8-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	5.8
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	12
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

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MAS I.D. # 002063-13

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-8-99/00-3	DATE ANALYZED	: 03/06/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	102	81 - 130
TOLUENE-D8	86	80 - 120
BROMOFLUOROBENZENE	100	75 - 118

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-8-99/00-3D	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	6.1
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	14
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-14

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-8-99/00-3D	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS

RESULTS

(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	102	81 - 130
TOLUENE-D8	93	80 - 120
BROMOFLUOROBENZENE	101	75 - 118

MAS I.D. # 002063-15

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-8-99/00-3R  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/07/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-15

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-8-99/00-3R	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY		LIMITS
1,2-DICHLOROETHANE-D4	100	81 - 130
TOLUENE-D8	91	80 - 120
BROMOFLUOROBENZENE	100	75 - 118

MAS I.D. # 002063-16

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-4-99/00-3  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/07/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
CHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	2.9
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

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MAS I.D. # 002063-16

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4-99/00-3	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

-----  
COMPOUNDS

RESULTS  
-----

(m+p)-XYLENE .....	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE .....	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	100	81 - 130
TOLUENE-D8 .....	98	80 - 120
BROMOFLUOROBENZENE	97	75 - 118

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4-99/00-3FA	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
TRICHLOROFORM	<1.0
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	<1.0
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-17

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-4-99/00-3FA  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/07/00  
UNITS : ug/L  
DILUTION FACTOR : 1

-----  
COMPOUNDS

RESULTS  
-----

(m+p)-XYLENE .....	<1.0
STYRENE .....	<1.0
O-XYLENE .....	<1.0
1,1,2,2-TETRACHLOROETHANE .....	<1.0
1,3-DICHLOROBENZENE .....	<2.0
1,4-DICHLOROBENZENE .....	<2.0
P-ISOPROPYLTOLUENE .....	<2.0
1,2-DICHLOROBENZENE .....	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4 .....	99	81 - 130
TOLUENE-D8 .....	96	80 - 120
BROMOFLUOROBENZENE .....	100	75 - 118

MAS I.D. # 002063-18

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
CLIENT I.D. : MW-4-99/00-3FT  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

DATE SAMPLED : 02/24/00  
DATE RECEIVED : 02/24/00  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/07/00  
UNITS : ug/L  
DILUTION FACTOR : 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<5.0
VINYL CHLORIDE	<1.0
BROMOMETHANE	<1.0
CHLOROETHANE	<1.0
TRICHLOROFLUOROMETHANE	<1.0
ACETONE	<10
1,1-DICHLOROETHENE	<1.0
METHYLENE CHLORIDE	<5.0
CARBON DISULFIDE	<5.0
TRANS-1,2-DICHLOROETHENE	<1.0
1,1-DICHLOROETHANE	<1.0
VINYL ACETATE	<10
2-BUTANONE	<10
TRICHLOROFORM	30
CIS-1,2-DICHLOROETHENE	<1.0
1,1,1-TRICHLOROETHANE	<1.0
1,2-DICHLOROETHANE	<1.0
CARBON TETRACHLORIDE	<1.0
BENZENE	<1.0
1,2-DICHLOROPROPANE	<1.0
TRICHLOROETHENE	<1.0
BROMODICHLOROMETHANE	1.1
CIS-1,3-DICHLOROPROPENE	<3.0
4-METHYL-2-PENTANONE	<10
TRANS-1,3-DICHLOROPROPENE	<3.0
1,1,2-TRICHLOROETHANE	<1.0
TOLUENE	<1.0
CHLORODIBROMOMETHANE	<2.0
2-HEXANONE	<10
TETRACHLOROETHENE	<1.0
CHLOROBENZENE	<1.0
ETHYLBENZENE	<1.0
BROMOFORM	<3.0

MAS I.D. # 002063-18

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
DATA SUMMARY

CLIENT	: ERM-WEST, INC.	DATE SAMPLED	: 02/24/00
PROJECT #	: 6067.25	DATE RECEIVED	: 02/24/00
PROJECT NAME	: SEATTLE QTLY. GW MONITORING	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4-99/00-3FT	DATE ANALYZED	: 03/07/00
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8260B	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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(m+p)-XYLENE	<1.0
STYRENE	<1.0
O-XYLENE	<1.0
1,1,2,2-TETRACHLOROETHANE	<1.0
1,3-DICHLOROBENZENE	<2.0
1,4-DICHLOROBENZENE	<2.0
P-ISOPROPYLTOLUENE	<2.0
1,2-DICHLOROBENZENE	<2.0

SURROGATE PERCENT RECOVERY

LIMITS

1,2-DICHLOROETHANE-D4	101	81 - 130
TOLUENE-D8	96	80 - 120
BROMOFLUOROBENZENE	98	75 - 118

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
QUALITY CONTROL DATA

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

SAMPLE I.D. # : BLANK  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
1,1-DICHLOROETHENE	<1.00	50.0	49.3	99	N/A	N/A	N/A
BENZENE	<1.00	50.0	49.9	100	N/A	N/A	N/A
TRICHLOROETHENE	<1.00	50.0	50.2	100	N/A	N/A	N/A
TOLUENE	<1.00	50.0	50.8	102	N/A	N/A	N/A
CHLOROBENZENE	<1.00	50.0	51.4	103	N/A	N/A	N/A

CONTROL LIMITS

	% REC.	RPD
1,1-DICHLOROETHENE	67 - 131	20
BENZENE	80 - 120	20
TRICHLOROETHENE	80 - 120	20
TOLUENE	80 - 125	20
CHLOROBENZENE	80 - 120	20

SURROGATE RECOVERIES

	SPIKE	DUP. SPIKE	LIMITS
1,2-DICHLOROETHANE-D4	100	N/A	81 - 130
TOLUENE-D8	101	N/A	80 - 120
BROMOFLUOROBENZENE	98	N/A	75 - 118

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
QUALITY CONTROL DATA

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

SAMPLE I.D. # : BLANK  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/07/00  
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
1,1-DICHLOROETHENE	<1.00	50.0	49.3	99	N/A	N/A	N/A
BENZENE	<1.00	50.0	49.2	98	N/A	N/A	N/A
TRICHLOROETHENE	<1.00	50.0	50.8	102	N/A	N/A	N/A
TOLUENE	<1.00	50.0	50.3	101	N/A	N/A	N/A
CHLOROBENZENE	<1.00	50.0	54.2	108	N/A	N/A	N/A

CONTROL LIMITS

	% REC.	RPD
1,1-DICHLOROETHENE	67 - 131	20
BENZENE	80 - 120	20
TRICHLOROETHENE	80 - 120	20
TOLUENE	80 - 125	20
CHLOROBENZENE	80 - 120	20

SURROGATE RECOVERIES

	SPIKE	DUP. SPIKE	LIMITS
1,2-DICHLOROETHANE-D4	99	N/A	81 - 130
TOLUENE-D8	98	N/A	80 - 120
BROMOFLUOROBENZENE	95	N/A	75 - 118

MAS I.D. # 002063

**MultiChem**  
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS  
QUALITY CONTROL DATA

CLIENT : ERM-WEST, INC.  
PROJECT # : 6067.25  
PROJECT NAME : SEATTLE QTLY. GW MONITORING  
SAMPLE MATRIX : WATER  
EPA METHOD : 8260B

SAMPLE I.D. # : 002063-13  
DATE EXTRACTED : N/A  
DATE ANALYZED : 03/06/00  
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
1,1-DICHLOROETHENE	<1.00	50.0	50.2	100	50.8	102	1
BENZENE	<1.00	50.0	52.9	106	52.5	105	1
TRICHLOROETHENE	12	50.0	66.8	109	65.9	107	1
TOLUENE	<1.00	50.0	48.0	96	46.1	92	4
CHLOROBENZENE	<1.00	50.0	55.1	110	55.9	112	2

CONTROL LIMITS

	% REC.	RPD
1,1-DICHLOROETHENE	72 - 137	20
BENZENE	80 - 133	20
TRICHLOROETHENE	79 - 120	20
TOLUENE	72 - 137	20
CHLOROBENZENE	80 - 120	20

SURROGATE RECOVERIES

	SPIKE	DUP. SPIKE	LIMITS
1,2-DICHLOROETHANE-D4	100	100	81 - 130
TOLUENE-D8	90	98	80 - 120
BROMOFLUOROBENZENE	103	98	75 - 118



## Appendix C

**APPENDIX C**

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**QUALITY CONTROL DATA  
VALIDATION REPORT - FEBRUARY 2000  
GROUNDWATER DATA**

## APPENDIX C

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## QUALITY CONTROL DATA VALIDATION REPORT - FEBRUARY 2000 GROUNDWATER DATA

Analytical data are the basis for evaluating the environmental conditions at the Seattle Air National Guard Station (Seattle ANG) in Seattle, Washington. A primary objective of environmental sampling conducted at the site is to obtain accurate data that reflect actual conditions.

This report addresses groundwater analytical data collected in February 2000 at the Seattle ANG as part of a quarterly monitoring program. Thirteen primary groundwater samples were analyzed for volatile organic analytes using United States Environmental Protection Agency (USEPA) Method 8260. To ensure that data quality was acceptable for decision-making purposes, analytical data for this project were validated. This process identifies limitations on the use of the data, or data that should not be used for decision-making purposes. The quality of the data was assessed and any necessary qualifiers were applied following the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (October 1999).

Environmental Resources Management (ERM) validated data for compliance with the following quality assurance/quality control (QA/QC) project- and/or method-prescribed criteria:

- **Holding Time and Preservation:** The holding time is the period of time between collection of the sample and preparation/analysis of the sample. Analyses performed for this project have method-prescribed holding times. Preservation refers to the temperature at which the samples are received at the laboratory, as well as any pH anomalies noted by the laboratory for acid-preserved samples.
- **Calibration:** The analysis of target analytes at a range of concentrations to develop a graphical plot of instrument response against the different analyte concentrations. An initial calibration curve establishes the graphical plot, and the continuing calibration

verification monitors daily instrument linearity against the initial calibration.

- **Blank Samples:** The preparation and analysis of samples from reagent (contaminant-free) water. Blank samples for this investigation included method, trip, rinsate, and field blanks. Detections in a blank sample indicate laboratory, handling, or field contamination.
- **Internal Standards:** The addition of compounds similar to target analytes of interest that are added to sample aliquots for organic analysis. The internal standards are used to quantitatively and qualitatively evaluate retention time and instrument response for each analytical run.
- **Spike Samples:** The preparation and analysis of an environmental sample or a sample of reagent water spiked with a subset of target analytes at known concentrations. The results of the spike analysis measure laboratory accuracy in the reagent sample, and results from the environmental sample spike measure potential interferences from the sample matrix.
- **Surrogate Spikes:** The addition of compounds similar to target analytes of interest that are added to sample aliquots for organic analysis. Surrogate spikes measure possible interferences from the sample matrix for the analysis of target analytes.
- **Duplicate Samples:** The preparation and analysis of an additional aliquot of the sample. The results from duplicate analysis measure potential heterogeneity of contaminant concentrations in the samples.

The following data qualifiers were used as appropriate during this validation process:

U: The analyte was analyzed for, but was not detected above the reported quantitation limit.

J: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ: The analyte was not detected above the reported sample quantitation limit; however, the reported quantitation limit was approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R: The sample results were rejected due to deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte could not be verified.

None of the February 2000 groundwater data was rejected based on the data validation. All of the data, including qualified data, are acceptable and can be used for decision-making purposes.

The following discussion addresses the results of the data validation for each of the QA/QC components listed above.

#### **Holding Time and Preservation**

The USEPA has established maximum recommended holding times for the analyses performed on the February 2000 groundwater samples. The USEPA has also defined the acceptable temperature range at which samples must be stored to maintain sample preservation. Holding times and sample temperatures extending beyond the maximum can negatively affect sample integrity (e.g., loss of volatile compounds, biodegradation), and impacted samples are qualified depending on the severity of the exceedence and the analytes of concern. The maximum recommended holding time for USEPA Method 8260 is 14 days for acid-preserved samples and 7 days for unpreserved samples. The recommended temperature range for sample storage is 2 to 6 degrees Celsius.

Each of the sample analysis results was reviewed for compliance with the method-prescribed preparation and analysis holding times. None of the analyses was performed outside of the prescribed holding time. Accordingly, sample results were not compromised by an excessive period between sample collection and analysis.

The temperature of the samples upon receipt at the laboratory was also reviewed for compliance with method requirements. The samples were received above the method-prescribed temperature range. The results for detected analytes were qualified "J," estimated concentration; the results for non-detected (ND) analytes were qualified "UJ," estimated detection limit (Table C-1).

#### **Calibration Results**

Before an analytical instrument is used for sample analysis, the instrument should be calibrated to within USEPA method specifications. The purpose of this calibration is to ensure that the instrument is appropriately

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**TABLE C-1**  
*Results Outside of Temperature Preservation Limits*  
*143rd CCSQ, Seattle ANG, Seattle, Washington*

Data Package	Temperature Upon Receipt	Preservation Limit	Sample ID	Analytical Method	ERM Qualifier*
002063	9°C	2 - 6°C	BS-006P2-99/00-3	8260	UJ
			MW-2-99/00-3	8260	UJ
			MW-1-99/00-3	8260	UJ
			BS-004PZ-99/00-3	8260	J/UJ
			MW-3-99/00-3	8260	UJ
			MW-10-99/00-3	8260	UJ
			MW-9-99/00-3	8260	J/UJ
			BS-005PZ-99/00-3	8260	UJ
			MW-6-99/00-3	8260	J/UJ
			MW-7-99/00-3	8260	UJ
			MW-5-99/00-3	8260	J/UJ
			TB022300-1	8260	UJ
			MW-8-99/00-3	8260	J/UJ
			MW-8-99/00-3D	8260	J/UJ
			MW-8-99/00-3R	8260	UJ
			MW-4-99/00-3	8260	J/UJ
			MW-4-99/00-3FA	8260	UJ
			MW-4-99/00-3FT	8260	J/UJ

°C = degrees Celsius

D = Field duplicate sample

FA = Field blank sample prepared with ASTM Type II water

FT = Field blank sample prepared with tap water

J = Reported values for detected analytes are estimated concentrations.

R = Rinsate blank sample

TB = Trip blank sample

UJ = Reported detection limits for analytes are estimated concentrations.

\* Qualifiers apply to listed samples.

responsive to measurable chemical concentrations. If an instrument is not properly calibrated, it may not be capable of producing acceptable quantitative, qualitative, and reproducible data. For example, positive detections of a given analyte could contain an undetermined degree of inaccuracy if the instrument is out of calibration, although the results may still be considered valid. In the case of ND analytes, the associated reporting limit would be similarly affected; however, such results would still be considered NDs.

Two types of calibration data were reviewed: initial calibration verification (ICV) and continuing calibration verification (CCV). The ICV consisted of standards that were analyzed at five or more concentrations. These concentrations ranged from the reporting limit to the upper linear range of the instrument. Average response factors from the ICV were used to calculate sample results. The laboratory evaluated the ICVs using relative standard deviation (RSD). The reported RSDs were compared to the method-prescribed acceptance criteria during the data validation. The only ICV target analyte with an RSD that exceeded the acceptable method-prescribed criterion was 1,2-dichloroethane. The majority of the 1,2-dichloroethane data were non-detect and were qualified "UJ," estimated detection limit. Positive detections of 1,2-dichloroethane were qualified "J," estimated concentration, based on the initial calibration results (Table C-2).

The CCV is analyzed either daily or every 12 hours to ensure the instrument response is still within method performance criteria for linearity. The CCV consisted of analyzing a standard at one concentration; the concentration of this standard was generally in the mid-range of the ICV standard concentrations. The laboratory calculated the percent difference (%D) between the CCV and the ICV. The %Ds were compared to the method-prescribed acceptance criteria during the data validation. Table C-2 lists the CCV %Ds that were above the method-prescribed criteria and the samples associated with each CCV, along with the applied data qualifiers. None of the analytes associated with an elevated %D was detected in the project samples.

### **Blank Samples**

Blank samples are prepared in the laboratory or in the field and are carried through the analytical process. The purpose of a blank sample is to test for contamination resulting from laboratory, shipping, or other sample-handling activities. Blank samples are analyzed and evaluated for detections of target analytes. If target analytes are detected in a blank

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TABLE C-2

Data Qualified Based on Calibration Results  
143rd CCSQ, Seattle ANG, Seattle, Washington

Analytical Parameter	Calibration (ICV/CCV)	Target Compound	RSD or %D	Instrument ID	Date	Associated Samples	ERM Qualifier*
VOCs	ICV	1,2-Dichloroethane	25.5	HP4	3/6/00	BS-006P2-99/00-3	J/UJ
						MW-2-99/00-3	
						MW-1-99/00-3	
						BS-004PZ-99/00-3	
						MW-3-99/00-3	
						MW-10-99/00-3	
						MW-9-99/00-3	
						BS-005PZ-99/00-3	
						MW-6-99/00-3	
						MW-7-99/00-3	
						MW-5-99/00-3	
						TB022300-1	
						MW-8-99/00-3	
						MW-8-99/00-3D	
						MW-8-99/00-3R	
						MW-4-99/00-3	
						MW-4-99/00-3FA	
						MW-4-99/00-3FT	
	CCV	Acetone	54.5	HP4	3/7/00	MW-8-99/00-3D	UJ
		2-Butanone	42.5			MW-8-99/00-3R	UJ
		4-Methyl-2-pentanone	23.9			MW-4-99/00-3	UJ
		2-Hexanone	34.0			MW-4-99/00-3FA	UJ
						MW-4-99/00-3FT	

Notes:

%D = Percent difference

CCV= Continuing calibration verification

D = Duplicate sample

FA = Field blank sample prepared with ASTM Type II water

FT = Field blank sample prepared with tap water

ICV= Initial calibration verification

J = Reported values for detected analytes are estimated concentrations.

R = Rinsate blank sample

RSD = Relative standard deviation

TB = Trip blank sample

UJ = Reported detection limits for the listed compounds and samples are estimated concentrations.

VOC = Volatile organic compound

\* Data qualifiers apply to listed samples



sample, these detections indicate that some element of the sample collection or analysis process has introduced contaminants not present in the original environmental sample aliquot. If target analytes are detected in a blank sample, then all associated data must be evaluated to determine whether:

- Those data have been similarly impacted; or
- The blank detections are an isolated occurrence not representative of other data.

The four types of blank samples analyzed and reported with the groundwater samples collected in February 2000 were method, trip, rinsate, and field blank samples. Preparation, handling, and analysis of these blank samples are summarized below.

1. Method blank samples monitor for potential laboratory contamination of samples. Method blank samples were prepared in the laboratory by taking an aliquot of reagent water through all preparation and analysis steps. A method blank was prepared and analyzed with each batch of environmental samples.
2. Trip blank samples monitor for potential contamination of samples during collection and transportation to the laboratory. Trip blank samples were prepared by filling a volatile organics analysis (VOA) vial with an aliquot of reagent water and sealing it with a Teflon-lined-septum lid. The trip blank sample travels with the filled aqueous sample containers to the laboratory.
3. Rinsate blank samples monitor for potential contamination of project samples from inadequate decontamination of sample collection equipment. Rinsate blank samples were prepared in the field by pouring American Society for Testing and Materials (ASTM) Type II reagent-grade water over the decontaminated sample collection equipment. The water was collected in clean sample containers supplied by the laboratory. Rinsate blank samples were labeled with an "R" identifier at the end of the sample ID.
4. Field blank samples monitor for potential contamination of project samples from ambient conditions at the sample collection site. Field blank samples were prepared at sample collection locations by slowly pouring tap water or ASTM Type II water into clean sample containers supplied by the laboratory. Field blank samples prepared with tap water were labeled with an "FT" identifier at the end of the sample ID.

The identifier "FA" was used to designate field blank samples prepared with ASTM Type II water.

No target analytes were detected in the method, trip, or rinsate blank samples. The common drinking water contaminants chloroform and bromodichloromethane were reported in the tap water field blank sample. Neither of these compounds was detected in any of the associated project samples, and none of the results required qualification based on the tap water field blank results.

### **Spike Samples**

A spike sample is a QC sample that is prepared and analyzed by the laboratory. The laboratory prepares, analyzes, and reports spike sample results to demonstrate their ability to properly analyze, detect, and quantify target analytes. A spike sample result is typically reported as the amount of analyte detected divided by the known amount spiked into the sample, and is commonly referred to as percent recovery. The percent recovery is then compared to an established limit range.<sup>1</sup> The two types of spike samples analyzed with the project samples were matrix and blank spikes.

1. Matrix spike (MS) samples consist of an aliquot of an environmental sample that is spiked with known concentrations of a subset of target analytes. A matrix spike duplicate (MSD) sample is a second (duplicate) spike sample prepared and analyzed with the MS sample. MS samples are used to monitor potential interference from the sample matrix for target analytes. A low MS recovery may indicate low-biased sample results; a high MS recovery may indicate high-biased sample results.
2. Blank spike samples, commonly referred to as laboratory control samples (LCS), consist of an aliquot of reagent water that is spiked with known concentrations of a subset of target analytes. The LCS sample is used to monitor laboratory accuracy without the bias of a sample matrix. LCS recoveries outside of acceptable limits may indicate poor laboratory accuracy.

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<sup>1</sup> In most cases, the prescribed analytical method will specify protocol to develop appropriate limit ranges. In some cases, however, limit ranges are established by the laboratory in the method procedures.

All of the MS and LCS recoveries were within acceptable limits. The acceptable MS and LCS recoveries indicate minimal matrix interference and acceptable laboratory accuracy for the February 2000 groundwater data.

#### **Internal Standard Responses**

Under USEPA methods, a given analyte list for organic compounds is segregated by chemical properties and retention time into one or more subsets. A USEPA-defined internal standard with comparable chemical properties and retention times is assigned to each subset of analytes. The laboratory adds a known concentration of an internal standard to each sample, including laboratory QC samples (e.g., calibration standards, MS, method blank samples), prior to analysis. The instrument internal standard response for each sample is compared to the internal standard response in the daily CCV. The sample internal standard area count must be within the range of 0.5 to 2 times the CCV area count, and the retention time must be within  $\pm 30$  seconds of the CCV retention time. If the area count and/or retention time measured for the sample is outside the acceptable range, quantitation results for the associated analyte subset may be biased. Interferences from the sample matrix are typically responsible for internal standard responses that are consistently outside acceptable ranges; most matrix interferences cause a consistently high or low bias.

Internal standards were added to each of the project samples analyzed for VOCs. The internal standard responses were within acceptable limits, indicating minimal matrix interference and acceptable sample quantitation.

#### **Surrogate Spikes**

A surrogate spike is similar to an internal standard; it is chemically similar to the target analytes and is only used in organic analyses. The difference between surrogate spikes and internal standards is that surrogate spikes are used only to assess possible interferences from the sample matrix, whereas internal standards are used to quantitate target analytes while accounting for any interferences from the sample matrix. Surrogate spike results are typically reported in terms of percent recovery, which is calculated by dividing the amount of surrogate detected in the sample by the known amount of surrogate added to the sample.

For the February 2000 groundwater data, surrogate recoveries were compared to the laboratory-generated limits of acceptance. The surrogate recoveries were within acceptable limits, indicating that sample results were not subject to interferences from the sample matrix.

### **Duplicate Samples**

A duplicate sample is a second aliquot of a sample that is treated the same as the primary sample. A duplicate sample analysis is performed to measure the precision of the method and possible heterogeneity of analyte concentrations in the sample matrix. Duplicate field samples are collected to measure matrix heterogeneity.

Laboratory duplicate analyses for the project samples consisted of MSD analyses. The laboratory calculated the relative percent difference (RPD) between the MS and MSD spike concentrations. The calculated RPDs were compared to method-prescribed or laboratory-generated acceptable limits. A field duplicate sample also was collected and submitted for analysis, and an RPD was calculated for detected analytes.

The duplicate sample RPDs were within acceptable limits, indicating acceptable analytical precision and minimal matrix heterogeneity.

### **Overall Assessment**

None of the Seattle ANGS analytical data for groundwater samples collected in February 2000 was rejected. The data set is 100 percent complete and meets the project goal for completeness. The data can be used for decision-making purposes. The quality of the February 2000 groundwater analytical data is acceptable for the preparation of technically defensible documents.

## Appendix D

**APPENDIX D**

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***CHAIN-OF-CUSTODY FORMS***



ANALYTICAL SERVICES

560 Naches Ave. SW Suite 101 Renton, WA 98055  
(800) 609-0580 • (425) 228-8333 FAX (425) 228-8336

LAB NUMBER: [REDACTED]

DATE: 1/25/02  
PAGE: 1 of 2

COMPANY: C R M West  
ADDRESS: 915 118th Ave. S.E.  
Suite 130  
Bellevue, WA 98005  
PHONE: (425) 462-8591 FAX (425) 455-3573  
ROJ. MGR / CONTACT: Rob Leet  
PROJECT NUMBER: (84) 075-75 6067.25  
PROJECT NAME: Seattle Q'ty. GW Monitoring  
DISPOSAL: ☐ MAG ☐ HOLD ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	TESTS
135-006 PZ-99/00-3	2/22/00	1410	W	
MW-2-99/00-3	2/23/00	1450	W	
MW-1-99/00-3	2/23/00	1525	W	
65-004 PZ-99/00-3	2/23/00	1550	W	
MW-3-99/00-3	2/23/00	1640	W	
MW-10-99/00-3	2/24/00	0920	W	
MW-9-99/00-3	2/24/00	0950	W	
B5-005 PZ-99/00-3	2/24/00	1040	W	
MW-806-99/00-3	2/24/00	1115	W	
MW-7-99/00-3	2/24/00	1150	W	
MW-5-99/00-3	2/24/00	1305	W	
TR022300-1	2/24/00		W	

DATE: 2/22/00	TIME: 1410	DATE: 2/23/00	TIME: 1450
DATE: 2/23/00	TIME: 1525	DATE: 2/23/00	TIME: 1550
DATE: 2/23/00	TIME: 1640	DATE: 2/24/00	TIME: 0920
DATE: 2/24/00	TIME: 0950	DATE: 2/24/00	TIME: 1040
DATE: 2/24/00	TIME: 1115	DATE: 2/24/00	TIME: 1150
DATE: 2/24/00	TIME: 1305	DATE: 2/24/00	TIME: 1305

Report in Level 4 CLP Format

FUELS	ORGANIC COMPOUNDS	METALS	TCLP	OTHER
TPH-HCID	TPH-G	TPH-D	TPH-G	TPH-D
BETX / TPH-G	BETX (by 8021)	TPH-G	TPH-G	TPH-G
BETX / AK101	AK-CRO	AK-CRO	AK-CRO	AK-CRO
AK-DR0	AK-DR0	AK-DR0	AK-DR0	AK-DR0
AK-102 / 103	AK-102 / 103	AK-102 / 103	AK-102 / 103	AK-102 / 103
8240 / 8260 GCMS Volatiles	8240 / 8260 GCMS Volatiles	8240 / 8260 GCMS Volatiles	8240 / 8260 GCMS Volatiles	8240 / 8260 GCMS Volatiles
8270 GCMS Semivolatiles	8270 GCMS Semivolatiles	8270 GCMS Semivolatiles	8270 GCMS Semivolatiles	8270 GCMS Semivolatiles
8081 Pesticides / PCBs	8081 Pesticides / PCBs	8081 Pesticides / PCBs	8081 Pesticides / PCBs	8081 Pesticides / PCBs
PCB only (by 8081) STD / LL	PCB only (by 8081) STD / LL	PCB only (by 8081) STD / LL	PCB only (by 8081) STD / LL	PCB only (by 8081) STD / LL
8021 Halogenated VOCs	8021 Halogenated VOCs	8021 Halogenated VOCs	8021 Halogenated VOCs	8021 Halogenated VOCs
8021 Aromatic VOCs	8021 Aromatic VOCs	8021 Aromatic VOCs	8021 Aromatic VOCs	8021 Aromatic VOCs
8310 HPLC PAHs	8310 HPLC PAHs	8310 HPLC PAHs	8310 HPLC PAHs	8310 HPLC PAHs
8041 Phenols	8041 Phenols	8041 Phenols	8041 Phenols	8041 Phenols
8151 OC Herbicides	8151 OC Herbicides	8151 OC Herbicides	8151 OC Herbicides	8151 OC Herbicides
Metals indicate below	Metals indicate below	Metals indicate below	Metals indicate below	Metals indicate below
Total / Dissolved Lead	Total / Dissolved Lead	Total / Dissolved Lead	Total / Dissolved Lead	Total / Dissolved Lead
RCRA Metals (8)	RCRA Metals (8)	RCRA Metals (8)	RCRA Metals (8)	RCRA Metals (8)
PP Metals (13)	PP Metals (13)	PP Metals (13)	PP Metals (13)	PP Metals (13)
TM Metals (23)	TM Metals (23)	TM Metals (23)	TM Metals (23)	TM Metals (23)
TCLP 8240 (Zn)	TCLP 8240 (Zn)	TCLP 8240 (Zn)	TCLP 8240 (Zn)	TCLP 8240 (Zn)
TCLP 8270 Semivolatiles	TCLP 8270 Semivolatiles	TCLP 8270 Semivolatiles	TCLP 8270 Semivolatiles	TCLP 8270 Semivolatiles
TCLP 8081 Pesticides	TCLP 8081 Pesticides	TCLP 8081 Pesticides	TCLP 8081 Pesticides	TCLP 8081 Pesticides
TCLP 8151 Herbicides	TCLP 8151 Herbicides	TCLP 8151 Herbicides	TCLP 8151 Herbicides	TCLP 8151 Herbicides
OTHER	OTHER	OTHER	OTHER	OTHER

SIGNATURE: [Signature]	SIGNATURE: [Signature]	SIGNATURE: [Signature]	SIGNATURE: [Signature]
PRINT NAME: Andrew Balla	PRINT NAME: Andrew Balla	PRINT NAME: Andrew Balla	PRINT NAME: Andrew Balla
DATE: 2/22/00	DATE: 2/22/00	DATE: 2/22/00	DATE: 2/22/00
TIME: 1450	TIME: 1450	TIME: 1450	TIME: 1450
COMPANY: C R M	COMPANY: C R M	COMPANY: C R M	COMPANY: C R M
SIGNATURE: [Signature]	SIGNATURE: [Signature]	SIGNATURE: [Signature]	SIGNATURE: [Signature]
PRINT NAME: [Signature]	PRINT NAME: [Signature]	PRINT NAME: [Signature]	PRINT NAME: [Signature]
DATE: 2/22/00	DATE: 2/22/00	DATE: 2/22/00	DATE: 2/22/00
TIME: 1450	TIME: 1450	TIME: 1450	TIME: 1450
COMPANY: C R M	COMPANY: C R M	COMPANY: C R M	COMPANY: C R M
SIGNATURE: [Signature]	SIGNATURE: [Signature]	SIGNATURE: [Signature]	SIGNATURE: [Signature]
PRINT NAME: [Signature]	PRINT NAME: [Signature]	PRINT NAME: [Signature]	PRINT NAME: [Signature]
DATE: 2/22/00	DATE: 2/22/00	DATE: 2/22/00	DATE: 2/22/00
TIME: 1450	TIME: 1450	TIME: 1450	TIME: 1450
COMPANY: C R M	COMPANY: C R M	COMPANY: C R M	COMPANY: C R M

COMPANY: ERM West  
ADDRESS: 715 118th Ave. SE.  
Suite 130  
Bellevue, WA 98005  
PHONE: (425) 1162-8591 FAX (425) 455-3573  
ROJ. MGR / CONTACT: Rob Leet  
PROJECT NUMBER: (REL) 6067.25  
PROJECT NAME: Seattle City, G.W. Morris  
DISPOSAL: ☐ MAS ☐ HOLD ☐ RETURN

[illegible]

<b>SAMPLE RECEIPT</b>		<b>TAT:</b>	<b>RELINQUISHED BY:</b>		<b>RELINQUISHED BY:</b>		<b>RELINQUISHED BY:</b>	
HAI # OF CONTAINERS	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> 24 HOURS	SIGNATURE:		SIGNATURE:		SIGNATURE:	
OG SEAL PRESENT?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> 48 HOURS	<i>[Signature]</i>					
OG SEALS INTACT?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> 72 HOURS	PRINT NAME:		PRINT NAME:		PRINT NAME:	
CEMP D COLD?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> 7 DAYS	<i>Anderson Balla</i>					
CEMP D INTACT?	<input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> SP	DATE: 2/24/00 TIME: 1450		DATE: TIME:		DATE: TIME:	
CEMP D NA		<input checked="" type="checkbox"/> STANDARD	COMPANY: F R M		COMPANY:		COMPANY:	
SPECIAL INSTRUCTIONS/COMMENTS:  IS - M-J-8-99/00-3 as MS/MSD 2nd time back at DIP format			<b>RECEIVED BY:</b>		<b>RECEIVED BY:</b>		<b>RECEIVED BY:</b>	
			SIGNATURE:		SIGNATURE:		SIGNATURE:	
			<i>[Signature]</i>					
			PRINT NAME:		PRINT NAME:		PRINT NAME:	
			<i>[Name]</i>					
			DATE: 2/24/00 TIME: 1450		DATE: TIME:		DATE: TIME:	
			COMPANY: F R M		COMPANY:		COMPANY:	
			<b>MASTER ONLY</b>		<b>SUBCONTRACT LAB</b>			